PB-230 717

REPORT ON THE SYMPOSIUM ON SNOW-MOBILES AND THE ENVIRONMENT HELD AT HANOVER, NEW HAMPSHIRE ON MARCH 3-5, 1972

Environmental Protection Agency
Washington, D. C.

1972

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 230 717

Environmental Protection Agency
Library Systems Branch, Room 2903
401 M Street, S.W.
Washington, D.C. 20460

"REPORT ON THE SYMPOSIUM ON SNOWMOBILES AND THE ENVIRONMENT"

At Hanover, N. H.
March 3-5, 1972

Sponsored by New England
Youth Advisory Board, U. S.
Environmental Protection Agency

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

Environmental Protection Agency
Library Systems Branch, Room 2903
401 M Street, S.W.
Washington, D.C. 20460

PAGE

INTRODUCTION. i

SUMMARY OF FINDINGS AND RECOMMENDATIONS iv

I GENERAL DEFINITION 1

A) Picture of Snowmobile 2

B) Snow Belt 7,8

II SPECIFIC ENVIRONMENTAL IMPACTS

A. Vegetative Impact 11

B. Impact on Animal Life 14

C. Impact on Non-Animate Components. . . . 24

D. Human Environmental Impact 29

Part I - Hearing. 29

Part II - Safety 41

III REGULATION 45

IV SOCIAL IMPACT 54

V RECOMMENDATIONS 62

VI APPENDICES

A. Chronology
B. Current State Laws (Comparative Chart)
C. Symposium Schedule
D. Bibliography

Introduction

Between March 2 and 4, 1973, the New England Youth Advisory Board to the United States Environmental Protection Agency sponsored a "Symposium on Snowmobiles and the Environment" at Dartmouth College, in Hanover, New Hampshire. In so doing, the Board acknowledged its concern with the rapidly intensifying problem of off-road vehicle use and the consequent environmental ramifications.

This report is an attempt to re-create the forum for discussion that the symposium represented. Of high importance is the definitely neutral stance of the Board, and the Agency, on this issue. In fact, the Agency has only limited jurisdiction over the phenomena, chiefly through the development of noise emission standards. The symposium thus afforded a neutral arena for the airing of a multitude of topics and issues; economic, social, and cultural implications shared the limelight with scientific reporting on environmental impact. Often, these former factors showed themselves to overshadow ecological concerns. The high level of emotionalism displayed both at the symposium at Dartmouth and in other confrontations of the two primary adversary groups involved, show indications of much deeper issues. Defining the off-road vehicle issue in terms of two groups, of course, represents a severe oversimplication. The legitimacy of this model arises, however, chiefly because large numbers of individuals intimately involved

with the problem, both snowmobile enthusiasts and the equally ardent snowmobile opponents, perceive it in this light.

The events of March 2-4, 1972, represent the culmination of a lengthy chain of events. The Symposium displays an eagerness of the EPA to extend its frame of thought beyond short-term, immediate crises and to examine potentially explosive issues while still in a manageable state. Additionally, the Board's entry into a major, substantive endeavor marks an important effort to fulfill its directive to advise the Agency on environmental concerns in a meaningful manner.

The results of the event can be measured in many ways. It did succeed in including the entire range of interests and perspectives on the issue, the "principal actors": industry representatives; Federal, state and local officials with regulatory responsibilities; snowmobile users, and representatives of the region's leading snowmobile user organizations; competing recreational users, such as cross-country skiers; and strong environmental advocates. As the program progressed, a measurable drop in the level of antagonism could be perceived. This essentially reflected the breakdown of previously-established stereotypes, as members of "adversary" perspectives became real figures through interaction, and as all parties united in efforts to develop recommendations designed to benefit all concerned. In addition, the Symposium provided a means for the collection and evaluation of data by the

Board for use in advising the Agency at a later date.

In this light, I submit the Report on the Symposium on Snowmobiles and the Environment, on behalf of the New England Youth Advisory Board.

Respectfully,

Derrick A. Crandall
January 20, 1973

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Convincing evidence of specific adverse environmental impacts resulting from snowmobile use exists. Unfortunately, such evidence addresses a mere handful of the array of potential effects. Furthermore, many of the physical environmental implications depend considerably upon such variables as terrain, climate, vegetative growth, and prevalent wildlife. Thus, far more research needs to be completed, reflecting both concerns for generalized effects and concerns for effects upon particular ecosystems.

The existing state of spotty scientific analysis has enabled extensive subjectivity to enter into evaluation of the environmental impact of snowmobiles. Definitive scientific data to moderate the intense emotionalism resulting from the challenges by these vehicles to such enculturated patterns as private property and wilderness areas is simply not available. Anecdotal information continues to represent a considerable portion of the knowledge on this issue. The societal stratification arising in areas of intensive snowmobile use between proponents and opponents of the sport dictates the necessity for thorough investigation.

In the face of both indications of certain established detrimental effects of snowmobile use and the vast range of

indetermined effects, the New England Youth Advisory Board strongly endorses comprehensive and effective regulatory measures. Most fundamentally, the reversal of the dominant existing pattern of posting areas closed to snowmobiles and other ORV's is recommended. Currently, areas available for such use are too vast and too poorly defined to allow monitoring and subsequent regulation. To remedy this, NE-YAB suggests the development and maintenance of trail systems, designed to skirt fragile ecosystems, and clearly marked general use areas.

Enforcement has clearly proven to be a major barrier to restrictive ordinances. In addition to endorsing general Federally-established codes for noise, exhaust emissions and safety standards, NE-YAB suggests several potential means of strengthening the Federal-state-local interface.

Reproduced from best available copy.

Consideration of the use of monies from the Federal and state gasoline taxes for developing and maintaining trail systems and regulating usage is urged. Clearly, trail systems are seen as a means of minimizing conflict between snowmobile users and others engaged in alternative recreational pursuits. The use of speed governors on snowmobiles is recommended for safety purposes and in fact seems well suited for usage patterns on trail systems.

Finally, NE-YAB has concluded that ORV use represents an environmental issue not yet raised to a crisis state.

Although the direct authority of EPA over such vehicles is small, they clearly represent potentially significant forces on air and water quality, as well as noise. Moreover, as EPA broadens its perspectives to fulfill its mandate "to protect and enhance" America's environment, considerations of land use will surely be a weighty concern. NE-YAB therefore commends the Agency for its forward-looking spirit in sponsoring this Symposium, and calls upon EPA to act in dynamic manner to implement and to encourage implementation of necessary policy changes.

I GENERAL DEFINITION

Off-road vehicles have had a long and colorful history. Until recently, most such vehicles have been used primarily as a specialized vocational tool. The past decade has shown a tremendous growth of interest in vehicles for leisure pursuits, and in fact the creation of the category of off-road recreational vehicles (ORRV's). Due to the novelty of this phenomena, comprehensive and uniform governmental regulations have not been yet developed and applied.

The format for this chapter, as well as subsequent ones, will rely on both limited explanatory and introductory passages, followed by a series of key questions, primarily those arising at the Symposium. The answers, where possible, reflect the sentiments of the featured speakers. Efforts have been made to insure inclusion of conflicting opinions and assertions, as well as Board commentary, particularly in the recommendations section.

Reproduced from best available copy.

Q. WHAT IS A SNOWMOBILE?

A snowmobile is logically a vehicle designed to travel over a surface accumulation of snow. The device is typically powered by a two-cycle engine (although several 1973 models feature so-called Wankel engines), driving a rubber-metal

track, generally 14-22" wide. Steering is accomplished through turning the two skis on the front of the snowmobile. Use of the snowmobile is normally restricted to either the rider alone or the rider and a passenger. Users of the machine can either kneel or sit on the foam cushion or crouch over it. The picture below is typical of 1972 vintage snowmobiles.

Q. HOW MUCH DO SNOWMOBILES WEIGH, AND HOW FAST CAN THEY GO?

Most snowmobiles weigh between 200 and 600 pounds, varying largely due to the wide variety of engines and add-on equipment available. Although some racing snowmobiles are capable of speeds in the vicinity of 200 MPH ("Big Al," with over 300 hp.), most snowmobiles have a top speed of 40-70 MPH. Terrain, of course, often prevents attainment of such speeds. Normal trail speeds range from about 10-20 MPH.

Q. WHEN AND WHERE WAS THE FIRST SNOWMOBILE BUILT?

Virgil D. White, of New Hampshire, constructed a large "snowmobile" in 1913 and received a patent for his device, which was essentially an auto with the front wheels replaced by runners and the rear wheels becoming a carriage for a revolving, continuous track.[1]

The first snowmobile of contemporary design was constructed by a Canadian, Joseph Bombardier, owner of the firm currently producing "Ski-doos," in 1959. Production was extremely low (a total of 16,000 units between 1959 and 1964) until after the mid-sixties.

Q. HOW MANY SNOWMOBILES ARE THERE IN NEW ENGLAND? U. S.?

Snowmobile registrations in New England for 1971-72 topped 150,000 units. Registration is restricted to private property; consequently, the potential exists for several thousands of machines to be uncounted within the 150,000 (see Table A).

TABLE A
Snowmobile Registrations in New England as of February 1, 1972.

State	No. of Registered Snowmobiles
Maine	50,113
Massachusetts	35,300
New Hampshire	34,350
Vermont	24,000
Connecticut	7,260
	151,023

At least four non-New England states boast snowmobile registrations in excess of 100,000: Wisconsin, Minnesota, Michigan and New York. Estimates on the total number of snow vehicles range between one and two million, with the total growing rapidly. ISIA estimates sales for the 1971-72 period as in excess of 600,000 units.[2]

Q. WHAT DOES A SNOWMOBILE COST?

Snowmobiles average about $1,000 with the normal price range between $600 and $1800. This reflects such differences as 9-80 horsepower and various levels of appearance and equipment.

The snowmobile is hardly the only investment required of the user, however. A trailer for carrying the vehicle averages between $200 and $500. Such options as electric starters ($125), sleds for additional family members ($150-200), speedometers, tachometers, extra fuel tanks, high-performance exhaust systems, tool assortments, and shock absorbers can nearly double the original investment. Furthermore, snowmobile suits ($50-100), emblazoned with company trademarks, have become highly popular. All totalled, the industry represents approximately $1,000,000,000 in sales annually.

Q. IS THE SNOWMOBILE ISSUE A FAD, LIKELY TO DISAPPEAR AND THUS MAKE CURRENT CONCERNS UNIMPORTANT?

Current evidence indicates that acceptances of this theory would be environmentally dangerous. Yearly sales continue to rise and the industry appears to be thriving. In addressing this question, Richard Gross said:

"There are those who believe the ORV is a passing fancy and perhaps, some night when they go to sleep, the machines will be gone in the morning. This 'ignore it, maybe it'll go away' type of negative attitude regarding an outdoor recreation is short-sighted and ostrich-like. I am afraid these machines will be around for a long time. And there will probably be a lot more and newere and more flexible ORV's in the future."[3]

Echoing this sentiment, Gregor McGregor went on to warn "...that a delay in the effects of regulation will preclude effective regulation in the future, because of that very simple economic cost-- ... loss of jobs and the threat of moving out of the state."[4] Economic entrenchment could effectively eliminate action based on environmental costs.

Q. WHAT ISSUES DOES SNOWMOBILING RAISE, AND WHAT PROBLEMS ARE POSED BY ITS USE?

The issues most commonly considered as part of the question of snowmobile use center around environmental stress, including

the impact upon the physical environment, vegetation, animal life, and the human environment. However, the questions of institutional and social impact of the growth of snowmobile usage are also important and must be considered. The single most wide-spread cause of complaints concerning snowmobiling results from the "psychological impact" of the sport, and such impact is mostly derived from noise effects.

Q. IS THE SNOWMOBILE OF SOLELY RECREATIONAL VALUE?

No. Although use of snowmobiles for recreational purposes constitutes an estimated 95% of the total usage, the vehicle has been successfully employed in rescue attempts of various nature, as well as for certain vocational pursuits, ranging from farmers to trappers to fish and game officers. Some ski areas now utilize snowmobiles for rescuing injured skiers regularly.

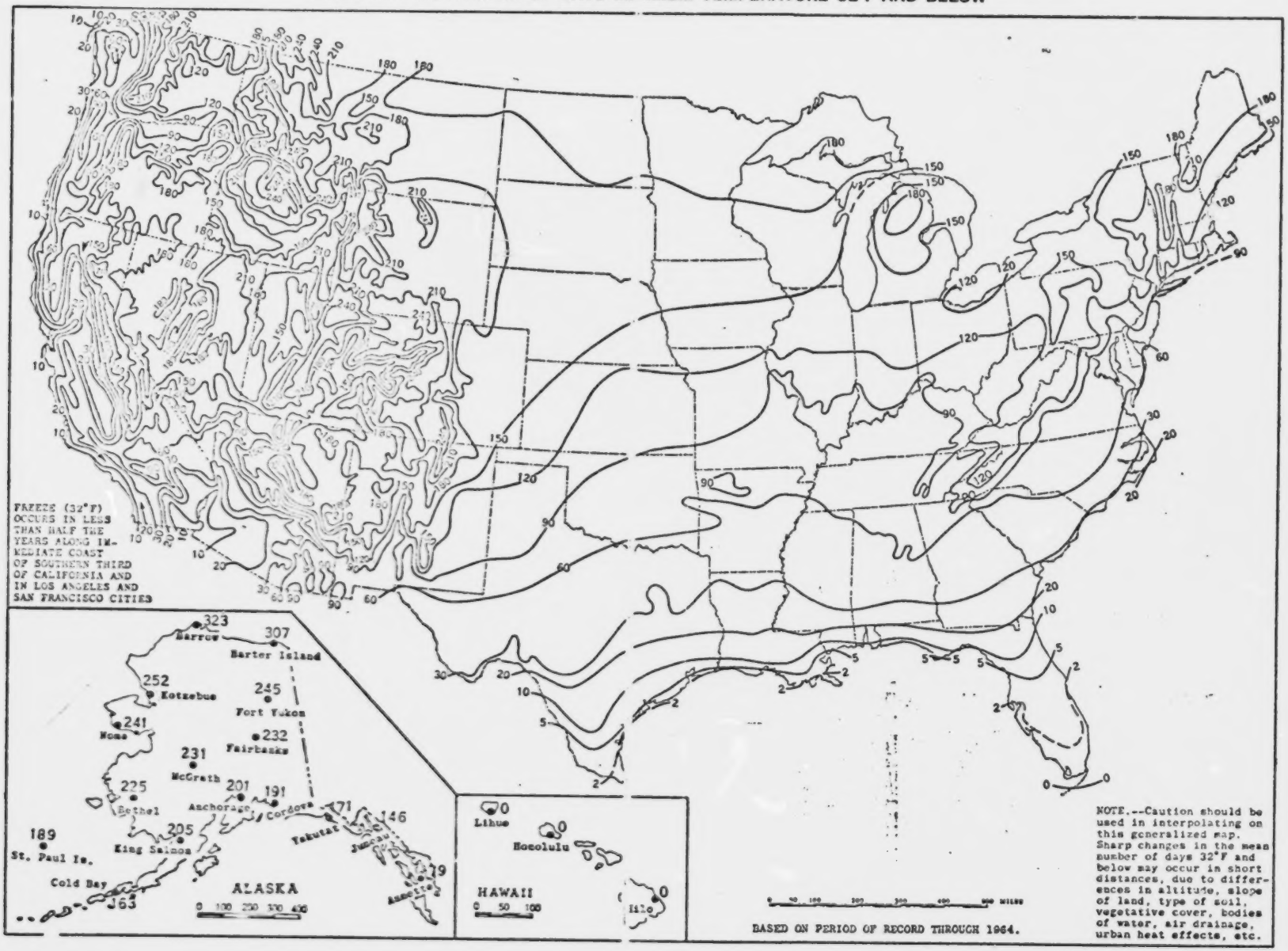
Q. HOW IS THE SNOWMOBILE SIMILAR TO OTHER OFF-THE-ROAD VEHICLES, AND HOW IS IT DIFFERENT?

The snowmobile is similar to other vehicles, in that its usage is primarily recreational, and that it is a motor-powered vehicle. However, its use is limited to the "snowbelt" areas of the country, areas where there is snow of one inch or more over 80 days each year (see maps A and B). Presently, the vehicle is unsuitable for use on dry land because its bearings

MEAN ANNUAL TOTAL SNOWFALL (Inches)

INSUFFICIENT DATA FOR ISOLINES
SNOW IN HIGH MOUNTAINS, RARELY AS LOW AS 6000 FT. ELEVATION
SNOW DOES NOT OCCUR
MEAN SNOWFALL (Inches) (Selected Stations)
ALASKA - THOMPSON PASS ABOUT 600
WASH. - RAINIER PARADISE R.S. 587
MT. BAKER LODGE 530
OREG. - CRATER LAKE 521
CALIF. - TAMARACK 445
SODA SPRINGS 398
IDAHO - ROLAND WEST PORTAL 275
NEV. - MARLETTE LAKE 241
UTAH - SILVER LAKE BRIGHTON 376
ARIZ. - BRIGHT ANGEL 132
MONT. - KINGS HILL 270
SUMMIT 253
WYO. - BECHLER RIVER 285
DOME LAKE 215
COLO. - WOLF CREEK PASS 409
SILVER LAKE 265
N. MEX - RED RIVER 136
MEAN SNOWFALL (Inches) - Cont'd (Selected Stations)
MICH. - HOUGHTON 178
N. Y. - BOONVILLE 207
PA. - KANE 107
W. VA. - KUMBRABOW STATE FOREST 126
N. C. - MT. MITCHELL 60
PARKER 47
MAINE - GREENVILLE 111
N. H. - MT. WASHINGTON 198
FIRST CONNECTICUT LAKE 172
VT. - SOMERSET 114
MASS. - WEST CUMMINGTON 85
CONN. - NORFOLK 93
CAUTION SHOULD BE USED IN INTERPOLATING ON THESE GENERALIZED MAPS, PARTICULARLY IN MOUNTAINOUS AREAS.
DATA BASED ON PERIOD OF RECORD THROUGH 1960.

MEAN ANNUAL NUMBER OF DAYS MINIMUM TEMPERATURE 32°F AND BELOW


FREEZE (32°F) OCCURS IN LESS THAN HALF THE YEARS ALONG IMMEDIATE COAST OF SOUTHERN THIRD OF CALIFORNIA AND IN LOS ANGELES AND SAN FRANCISCO CITIES
Barrow 323
Barter Island 307
Kotzebue 252
Fort Yukon 245
Nome 241
Fairbanks 232
McGrath 231
Bethel 225
Anchorage 201
Cordova 191
Yakutat 171
Juneau 146
St. Paul Is. 189
King Salmon 205
Cold Bay 163
ALASKA
Lihue 0
Honolulu 0
Hilo 0
HAWAII
BASED ON PERIOD OF RECORD THROUGH 1964.
NOTE.--Caution should be used in interpolating on this generalized map. Sharp changes in the mean number of days 32°F and below may occur in short distances, due to differences in altitude, slope of land, type of soil, vegetative cover, bodies of water, air drainage, urban heat effects, etc.

need water and its rubber tracks are easily damaged. Some snowmobiles, however, have been adapted for year-round use, by replacing the skis with wheel attachments for conversion to use on dry land. A conversion kit of this nature is currently being marketed.

Q. HOW MANY SNOWMOBILERS ARE THERE?

Assuming the presence of 1.5 million machines in the U. S., one immediately realizes that the popular estimate of three million users may be low indeed. Certainly at least two or three times this number have ridden these machines, and it seems conservative indeed to state that the U. S. has between two and four million enthusiasts, or 1-2% of the total population of the country.

Within New England, the number of in-state snowmobilers exceeds the number of resident skiers in New Hampshire, according to Mr. George Gilman, Commissioner for Economic Development. A similar claim was made by Vermont officials.

Q. HAS THE EMOTIONAL NATURE OF THE ISSUE PROMPTED ADOPTION OF STATE CODES AND REGULATIONS?

Yes, and no; in some instances, regulations have indeed been fostered by the adamant opposition snowmobiling has aroused. In other cases, the emotional cleavage inherent within the problem has resulted in an avoidance of the true

points of contention by politicians fearful of becoming closely identified with either side of the issue.

Q. CAN THIS EMOTIONALISM BE COMBATTED?

As John McGlennon, New England Regional Administrator of EPA, stated at the Symposium, "There is a paucity of information on the impact of snowmobiles on the environment. (This lack) of hard data has complicated the selection of regulations which should be adopted for the safety of man and the preservation of the environment."[5]

He went on to say that, "Unfortunately, this information gap has been filled by emotionalism and its resultant distorted and biased data. It is indeed ironic that snowmobilers are slandered by exaggeration and frequently are all painted by the same brush, in much the same way that environmentalists are attacked by the industrial community."[6]

The solution to such ignorance is continued and augmented research on the environmental impact of snowmobile usage. Not until many of the current allegations by both supporters and opponents of the sport have been investigated and scientifically documented will the present spectre of emotionalism be lessened.

//

II SPECIFIC ENVIRONMENTAL IMPACTS

A. Vegetative Impact

Although research on this particular aspect of snowmobiling is quite limited, at least two studies have been published indicating that the possibility for significant impact does exist. Additional subjective observations have been recorded, often conflicting, establishing a need for further scientific work to determine the actual extent of snowmobile-caused vegetative destruction.

Basically, two sources of possible adverse impact have been identified. Direct damage to trees and shurbs caused by snowmobiles running over such growth is the more apparent; the second is an indirect effect caused by snow compaction. It has been alleged that compacted snow significantly hinders the growth of bacteria and fungi by lowering the temperature in the subnivean microclimate.

Q. WHAT DOCUMENTATION IS THERE OF SNOWMOBILE DESTRUCTION OF TREES?

Malcolm Baldwin, of the Conservation Foundation, reported that during the 1969-70 season, Christmas tree farms in northern New Hampshire alone lost 30,000 seedlings and young trees as a result of snowmobile usage.[7] Quite

apparently, damage is also being done to non-crop trees on both public and private lands.

Dr. W. J. Wanek, of Bemidji State College in Minnesota, found that roughly 55% of those white spruce and nearly 50% of those Norway pines run over once or more sustain serious or fatal damage. Mortality of small willow trees exceeded 25% in areas of high snowmobile usage.[8]

Q. DOES SNOWMOBILING HARM OTHER COMMERCIAL CROPS?

Yes. Commercial blueberry crops in eastern Maine have been damaged by snowmobile use during periods of light snow cover.[9] Extensive use on snow coverage of less than one foot has also been found to hinder the spring growth of alfalfa and clover, two crops important to the dairy industry.[10]

Dr. James Whittaker, of the University of Maine School of Forestry, conducted a series of tests measuring the growth of forage grasses following varying intensities of snowmobile use against the growth in a control area. While he concluded that the tests were inconclusive, one can observe a potential trend from his figures:[11]

Plot	No. of Runs	Estimated Yield
Control	0	25.4 tons/acre
1	100	22.7 " "
2	150	30.4 " "
3	200	22.9 " "
4	250	22.1 " "
5	300	12.7 " "

Q. DOES SNOWMOBILE-CAUSED COMPACTION AFFECT CROP GERMINATION IN THE SPRING?

Quite possibly. The more dense snow cover has in some cases remained several weeks later than the adjacent non-compacted areas. Coupled with the lowered soil temperatures it induces throughout the winter, this has been thought to delay wheat crops in the mid-West by several weeks.

Current evidence on this matter is largely anecdotal, and conflicting. Scientific study, utilizing multiple control areas, is necessary to resolve this question.

II (cont'd)

B. Impact on Animal Life

There can be little doubt that snowmobiling has affected wild animal life, from small mammals to deer and coyotes. While some cases of intentional harassment and illegal hunting have been recorded, the real danger appears to stem from unpremeditated, careless interruption of feeding, migration and reproduction habits.

Available data in this field ranges from the careful scientific studies of Dr. William Schmid, of the University of Minnesota, to anecdotal information from a range of sources. Again, considerably more work must be done before the impact of snowmobiles on wildlife can be appraised accurately.

Q. WHAT EFFECT DOES THE SNOWMOBILE HAVE UPON THE SMALLER, LESS VISIBLE ANIMAL COMPONENTS IN FIELDS AND WOODED AREAS?

While we do not normally "see" what goes on under the snow cover in winter, this cover acts as a buffer between the harsher air environment and the soil-snow interface. Studies conducted by Dr. Schmid have considered the effects of snowmobile use upon this microclimate under the snow and the movement and survival of small mammals and winter arthropods.[12]

Q. DOES THIS MEAN THAT SNOWMOBILING CAN CAUSE CHANGES IN THE DENSITY AND OTHER PHYSICAL CHARACTERISTICS OF THE SNOW COVER?

Yes, in several ways. For one, the density and the thermal conductivity of the snow may indeed be affected by snowmobile use. Density profiles obtained from an area of heavy snowmobile use indicated that the snow was compacted to critical density (about .49 to .50 grams per cubic centimeter). This is approximately as dense as snow can be compacted without melting and refreezing.[13] Secondly, in areas where the snow cover had been undisturbed, the temperature profile differs markedly from that obtained in areas of heavy snowmobile usage. During a 36-hour period of very cold air temperature, the temperature at the soil-snow interface averaged -1 to -2 degrees Centigrade beneath undisturbed snow, even when air temperatures dipped as low as -25° C. In areas of even light vehicle use, temperatures at the same level were found to be -5 to -7° C., and in areas of intensive use, soil temperatures dropped to between -12 and -13° C.[14]

Q. WHAT IMPLICATIONS DO THESE EFFECTS HAVE FOR SUGGESTING THAT THE CHANGES IN MICROCLIMATE WILL HAVE AN IMPACT UPON WILDLIFE UNDERNEATH THE SNOW?

First, the significant lowering of subnivean temperatures radically alters the conditions under which small animals,

especially mammals, have evolved. This is a significant factor, however, only under conditions of heavy use over a widespread area; occasional passages will not produce an impact of a serious magnitude because only a small percentage of the soil-snow interface will be affected.

The increased density of the snow has produced another effect that has been noted by Dr. Schmid. Holes have been observed along each side of snowmobile trails through Jackpine forests in Minnesota, seemingly indicating that the compacted track served as a barrier to small burrowing mammals and forcing them to come to the surface, cross the trail, and drop beneath the snow again on the opposite side. Further studies by Schmid confirmed that snowmobile-caused compaction of the snow did indeed threaten the normal movement, and potentially the existence, of small mammals.[15]

Q. WHAT WERE THESE "FURTHER STUDIES," AND WHAT WERE THE RESULTS?

The experiments conducted by Dr. Schmid were set up in an area of controlled access where snowmobile usage could be manipulated for experimental purposes. The purpose of the study was to measure the weight loss in the animals in the field during the winter and to compare the controlled area (undisturbed) with the experimental area (compacted by snowmobile use), in terms of the stress upon the small mammal population imposed by the snowmobiling. A 24-station grid

was established and run for a total of 24 weeks. This study was initiated before snowfall and concluded subsequent to snowmelt.

When the study was started, no discrimination was made between the experimental and control areas. Techniques for capturing the small mammals included the use of both standard and special types of traps, and the mark-recapture method of studying small mammals. Each animal captured and subsequently released was marked by a toe-clip pattern, weighed and measured. The entire grid was trapped for 12 weeks, so that the animals were marked over the entire grid. Then the grid was divided in half, and half was snowmobiled, while the other half was left untouched. After the snowmobiling of the area was started, trapping efforts were intensified for the next twelve weeks. The results were calculated in terms of trap-days, a trap-day being defined as a single trap set for a total of 24 hours. These traps were set both at morning and at night.

A total of 612 trap-days was completed for the first half of the study, a total of 306 traps on each part of the grid. For the first twelve weeks, the results for the whole grid (eventually divided into the experimental and controlled areas) were fairly comparable. On what was eventually selected as the experimental plot, a total of 72 captures was attained during the first twelve weeks, 30 of these being new captures, and 42 being recaptures. Most of the animals were meadow

mice, meadow moles, short-tailed shrews and, occasionally, deer mice.

After snowmobiling was initiated upon the experimental plot, not one animal was captured from this area until the snow-free period in March. Schmid concluded that mechanical compaction of the snowfields (1) destroys subnivean air spaces, (2) reduces snow depth, and (3) increases density, thermal conductivity, thermal diffusivity and sheer strength of snow.[16]

Q. WHAT OTHER EXPERIMENTAL WORK HAS BEEN CONDUCTED TO CONSIDER THE EFFECTS OF SNOWMOBILE COMPACTION UPON THE MICROCLIMATE?

Experimental work on small winter invertebrates also indicates that snow compaction stresses other animals. A study conducted by Mr. Owen Marshall, a doctoral candidate in zoology at the University of Minnesota, revealed that compaction, probably because of its effect upon the microclimate in subnivean spaces, depresses the activity of these animals. This occurred primarily in small arthropods and insects, including spiders, mites, and springtails, animals which are primarily predator species within the food chain.[17]

Q. CAN THESE STUDIES BE REGARDED AS DEFINITIVE, OR ARE THERE ADDITIONAL FACTORS TO BE CONSIDERED?

The results of these studies and other studies have centered around the study of short-term effects of snowmobiling in various areas within the snow-belt. Furthermore, it may be difficult to generalize about the impact of snowmobile usage from one area to another. As Dr. Schmid pointed out in his discussion, his definition of "heavily compacted" snowmobiling area in Minnesota differed from that which he had observed in New England. However, the results of Dr. Schmid's studies and additional studies would indicate that the results should not be ignored and that it would be useful to ascertain how the impact differs in New England.

Q. WHAT ABOUT THE FREQUENTLY VOICED FEARS OF SNOWMOBILE EFFECTS ON LARGER WILDLIFE, ESPECIALLY DEER?

No scientific studies have been found in this area. Existing knowledge, therefore, stems from observations of users, conservation officers, and other interested parties. Studies both by EPA's NE-YAB and the Conservation Foundation found sufficient documented evidence to establish this as a serious problem. Harassment and kills have been recorded in Manitoba, Saskatchewan, the Yukon, Michigan, Minnesota, Idaho and Utah. The true extent of such overt actions is currently uncertain.[18]

Q. BUT WHAT OF THE NON-INTENTIONAL EFFECTS?

Again, this question remains unsettled. Among those effects most commonly noted are (1) predator intrusions into winter deer yards on snowmobile tracks, (2) disruption of mating patterns, (3) over-exertion of deer entering areas of heavy snow cover to evade curious "sight-seers."

Adequate evidence exists to label all of these occurrences serious in certain instances. Studies must be undertaken to determine the frequency of such disturbances, and the comparative impact of such actions and normal winter starvation. In Vermont, for example, an estimated 10,000 deer starved during a recent severe winter. Additional snowmobile disturbance may be trivial by comparison, and might therefore have a low net effect on the deer population.

Q. IS THE CHARGE THAT SOFT-PAWED PREDATORS MAKE USE OF THE COMPACTED TRAILS TO REACH DEER YARDING AREAS, AND THEREBY GAINING ACCESS TO A LARGE NUMBER OF DEER IN A RELATIVELY DEFENSELESS STATE, VALID?

This has happened to a degree in the past. It should be noted that evidence has been offered by proponents that instances of deer-use of these trails, to increase their winter foraging area, have been reported. It is unclear whether the harder, smaller hooves of deer are normally

supported by the compacted snow left by the passage of a snow vehicle.

This question is particularly salient in northern New England. The Hanover conference attracted considerable discussion on this topic. Paul Doherty, Senior Game Warden for the State of New Hampshire, and the owner of the third snowmobile in the East, commented on his observations:

> "If a dog gets into these yarding areas, he can make great inroads (in the deer population). It has frequently been said that the snowmobile trails lead the dogs into the deer yards, and this is true; but by the same token if you want to flip the coin over, the conservation officer, game warden, or whatever you want to call him, is empowered to attempt to correct some of these situations. He can go and station himself in a strategic location, and ...the point I guess I'm making is that it is then easier to kill deer-dogs because they are concentrated on snowmobile trails...where it's good and hard and easy-going."[19]

In his colorful observation, Mr. Doherty clearly signified his belief that the problem was neither extensive nor incurable. Another participant, Norman Hayes, Vice President of VAST, asked if the snowmobiler could be held accountable even if the tracks did indeed increase predation. "Why," he asked, "should we be blamed because the dog owner, who is the responsible individual in this case, doesn't keep his dog under his confine?"[20]

This problem would be markedly lessened, or eliminated, by limiting snowmobile travel to trails which have been routed so as to avoid coming close to deer yards. By utilizing overlooking terrain and by providing opportunities for

closer, non-motorized inspection by snowshoe and ski, these trails could still provide an exposure of wildlife in their natural surroundings.

Q. WHAT ABOUT THE CHARGE THAT SNOWMOBILES EXCITE LARGE ANIMALS AND DRIVE THEM INTO DEEPER SNOW, WHERE THEY QUICKLY BECOME EXHAUSTED?

Winter is a critical period for most wildlife, and certainly deer. The balance between food reserves and the caloric needs of the animals is typically quite close. Food is not plentiful and requires almost continuous searching. By exciting the animals and stimulating a large expenditure of their energy in the deep snow, snowmobiles can create havoc within this tenuous system. Not only are the deer forced to consume more food and diminish the reserve, but they are apparently left prone to diseases, particularly pneumonia.

Deer and elk, among other game animals, have been conditioned to fear noise. Therefore, the response described above can be incited by the passage of a motorized vehicle even at a sizable distance. Richard Wetterstey of the Minnesota Department of Conservation, concludes that unintentional imposition of stress on wildlife, through an innocent desire to observe them, seriously affects the survival rate of such animals.[21]

Q. WHAT ABOUT OTHER LARGER ANIMALS?

Several animals have been adversely affected. Beaver trapping, for instance, was greatly spurred by the advent of versatile snow machines. Pelts can be collected from lines four or five times longer than those used when snowshoeing served as the sole travel mechanism. In many areas, this has resulted in overtrapping and a virtual kill-off of beaver.[22]

Ice-fishing threatens to experience a similar phenomena, as vehicularly-borne fisherman increase numerically and further expand their sport to include even the most remote lakes.

Large predators, especially those subjected to a bounty system, seem to also suffer from the increased mobility afforded hunters. While hunting directly from snowmobiles is banned almost universally, as indeed is even carrying a loaded gun on such vehicles, enforcement of these laws appears lax and infractions seem common.

II (cont'd)

C. Non-Animate Components

Snowmobiling unquestionably produces a change in inanimate environmental components. Four identifiable changes which have been levelled at these machines are (1) that they measurably degrade air quality, (2) that, due to their relatively short-lives, snowmobiles pose a significant solid waste problem, (3) that they are aesthetically destructive, and (4) that the compaction resulting from their use alters run-off characteristics and can create erosion problems.

The classification of these effects under this heading may seem misleading, since each reflects an impact upon elements of the plant and/or animal communities. Yet, one may begin to realize through this that we are dealing not with primary effects in drawing these connections, but secondary and tertiary. Certainly, it is essential to observe the far-reaching implications accompanying each aspect of the issue, however lengthy the causal model may grow. Yet, this section allows us to examine areas in which the effects are largely speculative, and are not readily placed into a more specific niche.

Q. IT SEEMS THAT THE SMALL NUMBERS OF SNOWMOBILES IN USE, WHEN COMPARED WITH AUTOMOBILES, SPREAD OVER A MUCH WIDER PHYSICAL AREA, WOULD HARDLY WARRANT SERIOUS CONCERN FOR AIR QUALITY DEGRADATION. ARE THERE ACTUAL REASONS TO BE CONCERNED?

Yes; for one thing, food chains are lengthy and complex, and heavy metals and other pollutants entering the forest or field ecosystems could have serious implications. Even while granting the comparative innocuity of snowmobile exhausts, one must not completely eliminate them from consideration. Certainly heavy usage in one localized area--a racing track, perhaps--could measurably affect air quality.

Q. WHAT ABOUT THE SOLID WASTE PROBLEM, THEN?

This might rightfully command far more attention. Snowmobiles might well be thought of as a short-term investment--one plunged into obsolescence after 3 to 5 years of running by extensive mechanical component breakdown.[23] The potential problem of wholesale abandonment of these devices after they become worthless must be examined. In areas of extensive public land holdings, this problem is even more severe. Clearly, a large enforcement crisis could develop.

Of course, the ultimate junking of the machine is not the only solid waste problem. The two cycle engines require a gas-oil mixture. Consequently, a trail of metal cans and

plastic bottles has often come to mark a snowmobile trail, making tree blazes and signposts quite unnecessary. Other components, particularly spark plugs and fan belts, must be frequently replaced, and all too often join leaves and other organic debris on the forest floor. Enforcement here by governmental authorities is impractical; rather a revised ethic and a heightened awareness must be developed by the users.

Q. HOW CAN AESTHETIC CONSIDERATIONS ENTER INTO ANY LIMITATION OF SNOWMOBILE TRAVEL?

Realistically, aesthetic considerations are one of the key components of anti-snowmobile unity. However, it rarely surfaces. This reflects the dominance of quantifications in the American system of administrative cost-benefit analysis. The so-called "soft" concepts, those not easily converted into financial gains or losses, are avoided.

Concerns with the aesthetic implications of snowmobiling must be recognized as legitimate. Practically, the problem evolves into decisions of where snowmobiling should be allowed and where it should be barred. Policies to increase the segregation of competing recreational users should be adopted, as they would not only preserve areas from the perceived aethetic impact but also diminish the level of emotionalism between the antagonists.

Q. DOES SNOWMOBILING ACTUALLY AFFECT RUN-OFF PATTERNS?

Observation seems to indicate that it can and regularly does. The dense, compacted snow cover it leaves seems to last longer than surrounding, uncompacted snow. Then, as temperatures continue to rise, the remnant has been thought to melt suddenly and quickly. Gullying has been recorded in some published accounts and noted in personal interviews. Such run-off would appear to be more of a localized problem of soil erosion immediately adjacent to the user area; an argument noting the long-range effect on river flooding appears unconvincing. In fact, the prolonged imprisonment of water in such areas may be argued to lengthen the run-off period and thus serve to limit flooding. Little work in this field has been done to date; until it has, and scientific studies have shown otherwise, the run-off alteration may generally be regarded as a minor, localized problem.

Q. CERTAINLY COMPACTION RESULTS FROM DOWNHILL SKIERS THROUGHOUT THE REGION, YET THIS CHARGE HAS RARELY, IF EVER BEEN RAISED. ARE THERE IMPORTANT DIFFERENCES BETWEEN COMPACTION BY SNOWMOBILES AND THAT BY SKIERS?

The compaction on ski slopes within the region would indeed have many of the potentially damaging attributes of compaction caused by heavy snowmobile use. However, it is essential to recognize that skiing is largely restricted to

slopes serviced by ski-lifts, and is thus regulated quite effectively. Furthermore, most eastern ski areas rely heavily upon trails, as opposed to the tree-less open slopes common to the western areas. Again, this limits the area of usage to a small percentage of the mountain-side, and to a degree controls run-off.

Because of the nature of the terrain required for the sport, though, skiing presents a more serious threat of erosion; if compacted snow is indeed found to melt within a more concentrated time span, increased erosion would be a logical expectation. This would be further compounded by vegetative damage incurred by compaction. Most ski areas have attempted to control wash-off by constructing water bars and other restraining devices. This is, of course, more practical for this sport, as slopes receiving use are well-defined and identified prior to the advent of winter. Snowmobiling, on the other hand, is a phenominally flexible sport, and the areas of potential usage are too vast to allow realistic prevention efforts unless regulations far more restrictive than those currently enacted are developed, and user areas are similarly well-defined.

II (cont'd)

D. Human Environment

Part I: Hearing Damage.

Man, as part of the total ecosystem, must also consider the possible effects that snowmobile use might have upon himself. Diagram A shows the comparative noise levels of several typical environments. One of the major complaints about snowmobiling is the fact that the machines themselves are "noisy." These complaints could be considered to arise from both the social impact upon non-users and the question of the possible impact upon the operator or rider of a machine. Dr. Fred Bess, Director of Audiology at Central Michigan University, has conducted studies of the effect of snowmobile engine noise upon the hearing mechanism.

Basically, Dr. Bess's studies have investigated the degree of temporary threshold shift, or temporary change, in hearing in individuals after exposure to continuous snowmobile engine noise and the effects of high speed snowmobile engine noise on hearing.

Q. WHAT IS A "THRESHOLD SHIFT?"

A threshold is considered to be the minimum physical energy necessary to activate a given sensory system. A threshold shift would involve considering how the amount of energy necessary to activate the hearing mechanism is affected after exposure to noise.

Sound Levels and Human Response

- 30 -

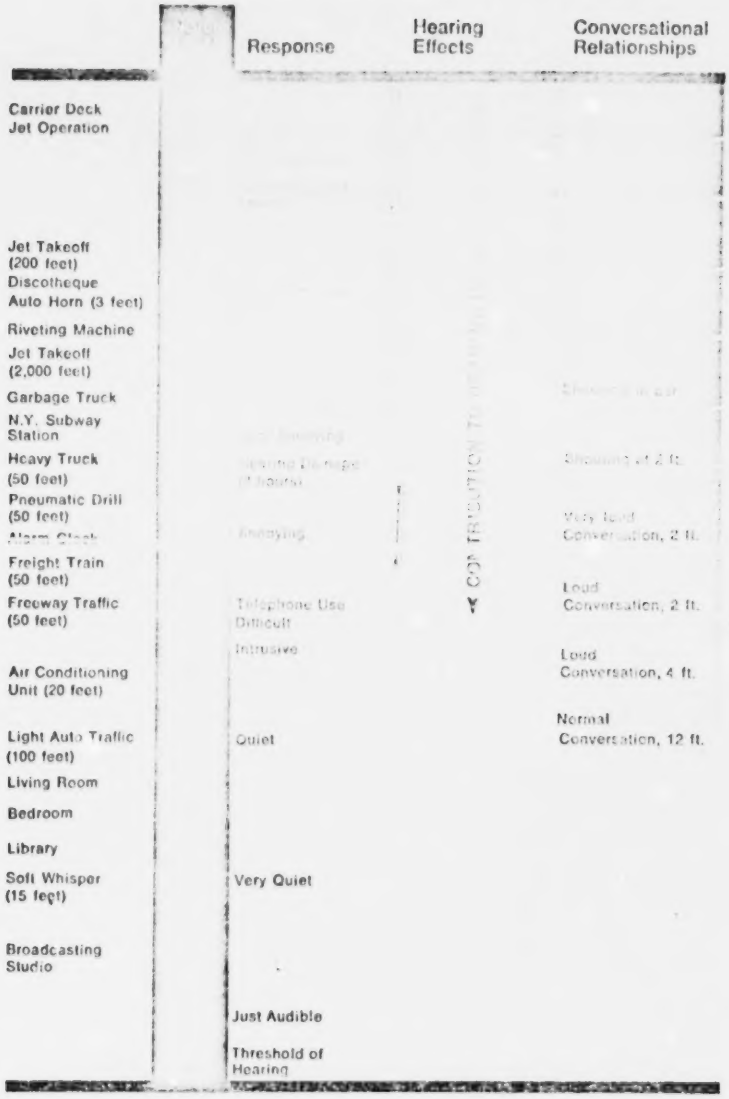


DIAGRAM 7

Q. HOW ARE THESE MEASUREMENTS MADE FOR DETERMINING HOW WELL ONE HEARS?

These measurements are made in terms of decibels heard at a given frequency of energy, which is measured in Hertz. A decibel is a unit used to express the intensity of a sound wave, equal to 20 times the common logarithm of the ratio of the pressure produced by the sound wave to a reference pressure, usually .0002 microbar of 1 microbar.

Q. WHAT HAVE BEEN THE RESULTS OF THE INVESTIGATION OF THE DEGREE OF TEMPORARY HEARING THRESHOLD SHIFT, OR TEMPORARY CHANGE IN HEARING?

In a group of individuals, who had been exposed to one hundred and twenty minutes of continuous snowmobile engine noise, the results indicated that the temporary threshold shift averaged 3 decibels at the octave band frequency of 250 Hertz, 5 decibels at 500 Hertz, 6 decibels at 1000 Hertz, 7.5 decibels at 2000 Hertz, 10.5 decibels at 4000 Hertz, and 5.5 decibels at 8000 Hertz[24] (refer to Diagram B). Using recovery of hearing data on the temporary threshold shift at 4000 Hertz, it was estimated that the average subject tested at 30 minutes post-exposure may have demonstrated as much as 20 db to 40 db temporary threshold shift, had they been measured 2 minutes after exposure to the noise.[25]

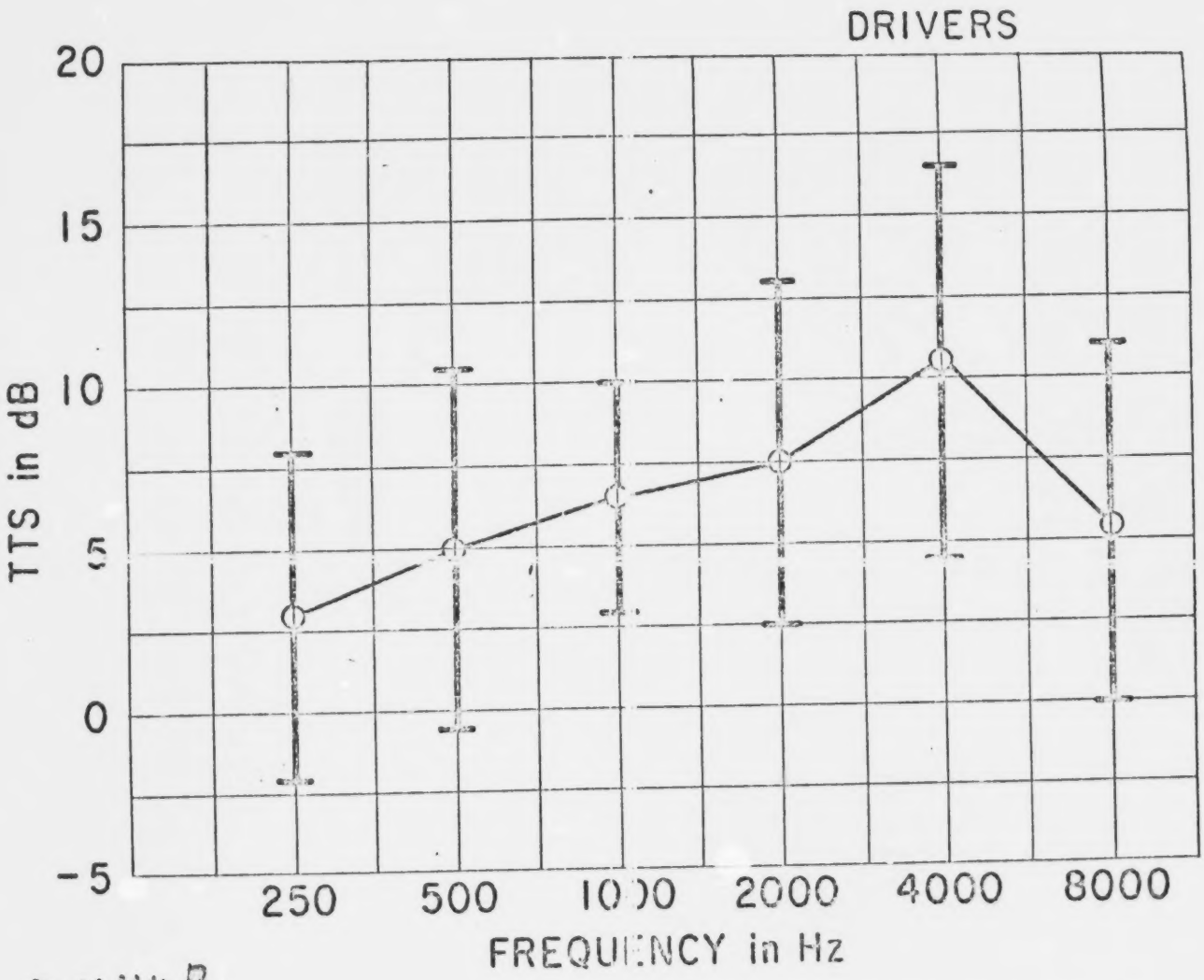


DIAGRAM B.
~~Slide~~ 1. Amount of Temporary Threshold Shifts and Standard Deviations, in Decibels at Each Octave for the Driver Group. (FROM BESS' PAPER).

Q. WHAT ADDITIONAL CONSIDERATIONS MUST BE MADE WHEN CONSIDERING WHAT THIS DATA MEANS?

Although this data suggests that snowmobile engine noise is potentially hazardous to the hearing, Dr. Bess pointed out that several considerations must be made when interpreting the results of the temporary threshold shift. The relationship between temporary threshold shift and permanent threshold shift is unclear, and the data provided by different investigators demonstrate conflicting results with respect to this question. There is also a possibility that a factor other than excessive noise contributed to the temporary threshold shift reported in the study; noise and vibrations combined may also produce greater temporary threshold shift than noise alone. Furthermore, many snowmobilers spend more than two hours on their machines; for example, day-long safari trips. It is well known that exposures of long duration can be considered more hazardous to the hearing mechanism.

Q. WHAT HAS BESS'S INVESTIGATION OF THE EFFECTS OF RACING SNOWMOBILE ENGINE NOISE ON HEARING REVEALED?

The purpose of this study was to determine the threshold levels of both racing drivers and snowmobile mechanics, to obtain sound pressure level measurements on representative samples of high speed snowmobile engines at critical spectator distance points, and to determine the amount of temporary

threshold shift in a group of spectators following exposure to the noise.

Measurement of the intensity levels of snowmobile engine noise at race tracks indicated that average levels were 104 db and ranged from 100 to 107 db. (It must be pointed out that this is at the distance of the majority of spectators.) Although the intensity levels decreased as the distance decreased, the intensity was never below 80 db throughout the race. The average db levels and peaks obtained at three strategic points on the inside of the tracks (a distance of 10 to 15 feet from the track) revealed a range from 90 db at the outer curve to 104 db at the straightaway, with peak readings ranging from 107 to 155 dba. Spectators placed at a distance of twenty feet at the outside of the track at critical areas as well as along the insides of the track were found to have experienced temporary threshold shifts at 4000 cycles per second, ranging from 10 to 35 dbs.[26]

Q. WHAT DOES THIS MEAN?

Consideration of the sound pressure levels caused by a 26-horsepower engine (1971-2 vintage) indicate that the sound spectra produced by snowmobiles at full throttle, idle, and mid-throttle surpass the damage-risk contour for hearing loss established by the Committee on Hearing and

Bioacoustics. A smaller, 22-horsepower engine is also found to exceed this level, although only at higher RPM levels (see Diagrams C, D).

Q. DOES THIS ALSO MEAN THAT ALTERING A SNOWMOBILE ENGINE FOR RACING PURPOSES MIGHT HAVE AN EFFECT UPON THE DRIVERS?

Hearing tests conducted on drivers and pit mechanics to obtain hearing thresholds indicated high frequency notching. The mean threshold value at 4000 Hertz was 28 db, at 6000 Hertz, 35 db, and at 8000 Hertz, 14 db. The audigram of one representative individual, a 29 year old male, who had been driving snowmobiles for some seven years, the last three as a racing driver, displayed relatively normal hearing up to 2000 Hertz. However, a "precipitous" threshold drop of 70 to 80 db was measured at 4000 Hertz. This is representative of high-frequency notching. The findings obtained for the mean hearing thresholds and standard deviations for five pit mechanics indicated similar effects of high-intensity noise levels as for the racing drivers. In this group, greater loss was exhibited at 2000 cps. Although seventeen of the twenty-one subjects had had previous exposure to other sources of noise (motorcycles, farming equipment, and hunting), the conclusions of the study were that long-term periods of exposure to snowmobile noise was a major contributor to the hearing losses in these subjects.[27]

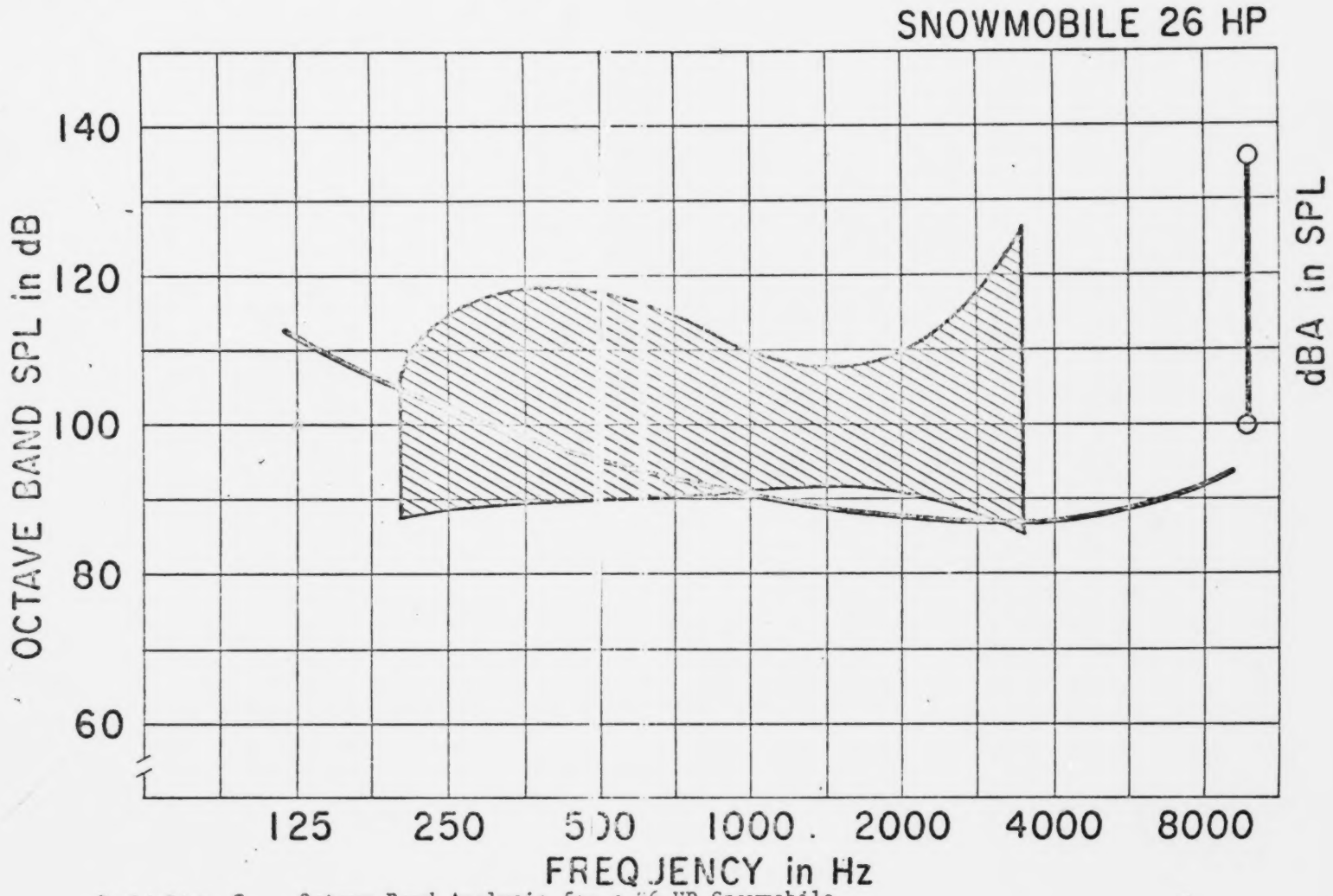


DIAGRAM C Octave Band Analysis for a 26 HP Snowmobile

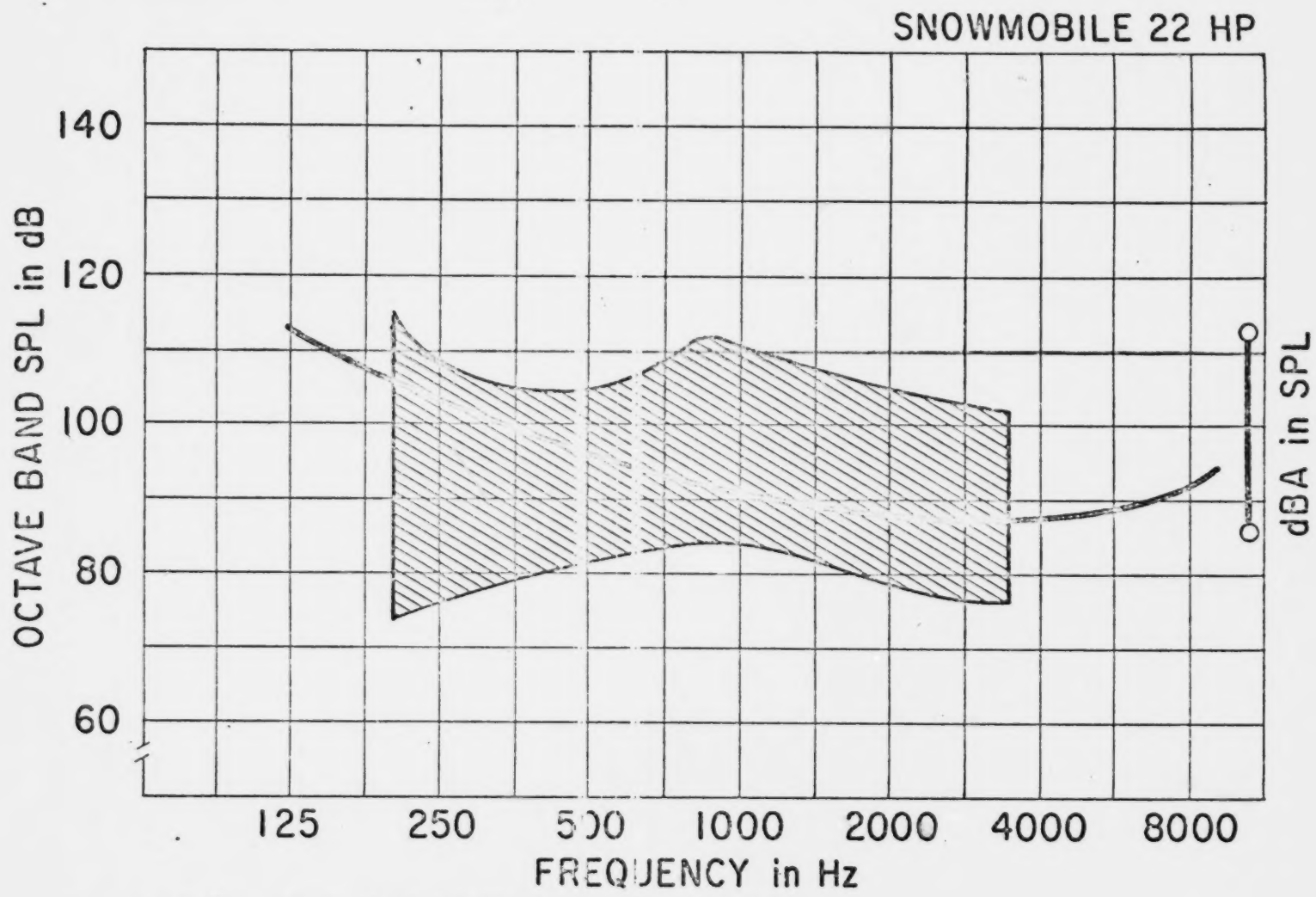


DIAGRAM D Octave Band Analysis for a 22 HP Snowmobile.

Q. WHAT DO THESE STUDIES SUGGEST?

These suggest that snowmobile engine noise poses a threat to hearing; however, it is assumed that this damage comes only after repeated exposures for prolonged periods of time. Another consideration is that there may be a wide variance in susceptibility to noise damage among individuals. It is still possible for a person to experience serious damage as the result of a brief period of exposure time. One example of this is the case study of permanent hearing loss experienced by a 61-year old male after a snowmobile ride, as reported from the Central Michigan Hearing Clinic. Prior to the ride, the subject had stated that his hearing had been essentially normal, and past audiological records backed his statements. Following five hours of snowmobiling, with use of a full-size crash helmet, the subject noted a very dramatic change in his hearing capacity. A month following this exposure, noise-induced hearing loss was diagnosed by a physician. The ability of this man to discriminate different speech sounds, even when the signal was made comfortably loud, was only 76%.[28]

Q. WHAT RECOMMENDATIONS HAVE BEEN MADE TO COMBAT THIS TYPE OF SITUATION?

The recommendations offered by Dr. Bess were that the manufacturers attempt to consider reducing the noise level output of the machines, and that if this is not possible,

that adequate ear protection be provided for operators, riders, and spectators.

Q. WHAT ABOUT MANDATORY USE OF EAR PLUGS?

This might indeed diminish the threat of hearing damage to snowmobile users by their vehicles. However, persons, and especially spectators, located in a high-use area could still be affected. Also, the earplugs would serve to insulate the users from auditory signals from other persons, as well as such other danger signals as cracking ice, other moving vehicles, etc.

Q. ARE THERE MAJOR DIFFERENCES BETWEEN THE ENGINES IN CARS AND THOSE IN SNOWMOBILES, ADEQUATE TO EXPLAIN THE SUBSTANTIALLY HIGHER NOISE OUTPUT OF THE LATTER?

This question is misleading; several factors are reflected in the higher noise output, one of which is certainly the characteristics of a two-cycle engine. The physical characteristics of the vehicle also have an effect. Current snowmobile designs preclude utilization of extensive exhaust muffling equipment. The nature of the drive train also differentiates the vehicles. At cruising speeds, an automobile utilizes considerably less than 50% of its maximum potential power, chiefly due to a varying series of gears in the transmission. A snowmobile has only one set of

gears, and cruising speeds demand 60% and more of the potential engine horsepower. Moreover, this produces a linear relationship between snowmobile speed and noise.

II (cont'd)

D. The Human Environment

Part II: Safety.

Snowmobile-caused injuries have received considerable attention. The National Safety Council has pushed for increased utilization of safety devices, such as "kill" buttons, and codes which can assist in limiting the growing incidence of snowmobiling injuries. Several studies of injuries to users have been carried out, and particular attention has been given to maxillo-facial and spinal damage. Among the most frequent causes of such injuries are improper use of the machines (jumping, speeding, etc.), use of alcoholic beverages, inexperience, and use on, or improper crossing of, highways. Obviously, many of these factors can act in a contributory mode. Furthermore, physical obstacles, such as barbed-wire fences, common throughout the rural countryside, become particularly dangerous during night-time treks. Misjudgment of ice conditions has also been a significant cause of fatalities; Lake Massabesic, in New Hampshire, experienced such a tragedy during March, 1972, resulting in three deaths and the endangerment of many more. For these physical dangers, a series of well-designed and well-groomed trails would be a major step toward reducing resultant injuries.

Q. WHAT STATISTICS ARE AVAILABLE REGARDING SNOWMOBILE INJURIES?

A Minnesota survey made during the 1970-71 season showed 1 out of every 25 snowmobilers to have been involved in a "serious accident" during that season.[29] If this ratio was true nationally, this would mean some 60,000 serious accidents (4% of 1.5 million users). In light of reported deaths and injuries, this number seems too high. The New York Times could only find records of 139 persons dying of snowmobile injuries in the U. S. during the 1970-71 season, and approximately 100 more in Canada.[30] This does indicate a sizable jump from 1968-69, however, when only 54 snowmobile-related fatalities were reported.[31]

Q. WHAT TYPES OF INJURIES DO OCCUR?

Perhaps a run-down of the available studies would be the best answer to this question.

Chism and Soule analyzed Vermont snowmobile injuries during the 1968-69 season. They concluded that

> "Often the type of injury can be correlated with the mechanics of snowmobile construction and operation. For example, compression fractures of vertebrae appear to result from the inability of the spine to absorb the shock of traveling over irregular terrain. Most fractures, bruises and lacerations resulted from faulty operation of the vehicles."[32]

Karleen and Johnson studied injuries in the Minneapolis region during 1969. They found more than two-fifths of the

injuries were to the lower extremities (41.7%), followed by injuries to the head and neck (26%) and to the upper extremities.[33]

Dominici, conducting a study in Maine between 1968 and 1970, also found injuries to the lower extremities most common (36%). He felt that:

> "The lower extremities are the most frequently injured because they are exposed and the inexperienced operator often extends his leg at high speeds for balance, and in doing so at 30 and 40 miles per hour catches it in a snowdrift or fence."

He further found that 20% of the injuries were to the head and neck, although these occurred in a disproportionally high number of fatalities.[34]

Q. WHAT ABOUT MECHANICAL FAILURES CAUSING INJURIES?

Apparently, this is a minor cause of accidents, perhaps as low as 5%. The user's conduct appears to be far more significant in this regard. Frequently, mis-operation is caused by or compounded by alcoholic consumption and resultant slowed reflexes. Studies in Vermont, Canada, and Maine all serve to support this contention.

Q. NONETHELESS, ARE THERE POSSIBILITIES OF THE MANUFACTURERS MAKING SNOWMOBILING SAFER?

Yes, and they have devoted some efforts to this field. Perhaps the most effective additional device would be a

speed governor and reasonable constraints on horsepower. Better lighting, a "kill" switch, improved suspensions and better brakes would no doubt prevent some injuries. Good protective headgear can also be of value.

Perhaps the most progressive step the industry could make would be to work to alter the image of snowmobiling in their advertisements. Indeed, they have come to refrain from depicting wild jumps and other dangerous practices. More, however, could be done. Certainly, less emphasis should be placed on speed and racing. If industry spokesmen are accurate in stating that power is what the potential buyer seeks,[35] and thus must be reflected in sales pitches, governmental regulation and educational efforts appear necessary.

III REGULATION

Regulation is certainly a central issue in the off-road vehicle issue. A "good" law is often viewed merely as one that can be enforced. While little substantive knowledge is available on many of the previously discussed topics, one finds that even if environmentalists could arm themselves with such data, more problems abound. The techniques for adequate enforcement do not exist.

The whole area of snowmobile laws appears as a hodge-podge of concepts and ordinances, fluctuating widely between states, and even from community to community. The variations in reciprocity of registration, property owner rights, etc., are astounding. Furthermore, revisions or wholesale replacement of existing state and local statutes have taken place constantly, dating and rendering essentially useless efforts to compare the laws of the six New England states.

Q. WHAT REGULATIONS CURRENTLY GOVERN THE USE OF SNOWMOBILES?

The majority of New England states have passed so-called snowmobile laws. Those statutes most commonly utilized by enforcement officials, however, are traditional trespass and public nuisance ordinances. The snowmobile laws are chiefly concerned with registration and modification of existing regulatory policies for use with this specific

type of vehicle; for example, most laws either define the land-owner's responsibilities for posting his land to prevent use or require users to obtain prior permission from the owner to avoid arrest for trespass.

Local ordinances have also been established in many areas of extensive snow-vehicle usage. Many of these establish curfews and define a buffer zone around residential areas within which snowmobiles are prohibited.

All New England states ban snowmobile use on interstate highways and major state arteries, except in special instances. Even crossing such roads is either prohibited or strictly limited. (For a more in-depth comparison of state laws within New England, see Appendix B.)

Q. WHO ENFORCES SUCH CODES?

These codes are enforced by a combination of state and local police, and park and conservation officers. Jurisdictions range widely among the six New England States. In Vermont, for example, any body of water covered with ice is classified by state law as a public way; thus state police have prime responsibility. In other states, such as New Hampshire, enforcement responsibility rests chiefly with Fish and Game Department officials, hindered in their efforts both by limited manpower and by a lack of appropriate training.

Q. IS ENFORCEMENT ADEQUATE?

Rarely. The nature of the problem and the lack of special equipment greatly limit efforts by state and local officials. The snowmobile is a swift, highly mobile vehicle, and is thus difficult to follow on anything but a faster, more agile craft. Further, many of the violations occur at night, compounding the problems of enforcement. Registration numbers are typically too small to be seen at a distance.

Q. AT THE MASSACHUSETTS HEARINGS ON THEIR 1972 SNOWMOBILE LAW, IT WAS SUGGESTED THAT SNOWMOBILE TRACKS BE IMPRINTED WITH THE REGISTRATION NUMBER OF THE VEHICLE, SO THAT IT WOULD LEAVE A "FINGERPRINT" TO BE USED IN CASES OF VANDALISM OR TRESPASS. IS THIS A VIABLE SOLUTION?

Apparently not. For this to be effective, slow speeds and ideal snow conditions would be necessary. Normal use entails some degree of track slippage, blurring any imprint. It would also seem apparent that any individual contemplating vandalism or theft utilizing a snowmobile would take steps to insure that such identification was destroyed.

Q. WHAT ABOUT ENFORCEMENT OF NOISE CONTROLS?

Again, enforcement here is limited. Although most states call for lower levels of noise emissions over the next five years, such requirements deal only with the manufacturer's

initial responsibility. No operational testing programs currently exist in the region. Enforcement officials are not equipped with noise measurement devices, and thus must base arrests on subjective judgments.

Secondly, owner modifications are perhaps the most severe cause of increased noise output. The addition of straight exhaust pipes and the removal of muffling devices is common, and uncontrolled. Extensive testing and/or inspection for these alterations would be expensive and difficult. The noise-power intellect, alleged to be pervasive among snowmobile users by Jack Hoene of the International Snowmobile Industry Association,[36] must be changed. This phenomena is considered to be a major factor in the competitive snowmobile accessory market; louder vehicles are imagined to be more powerful. Thus, competition exhaust systems are quite popular.

Q. CAN REGULATION BE ACCOMPLISHED BY THE USERS THEMSELVES, THROUGH CLUBS AND SELF-POLICING?

This avenue seems quite promising. In New England, snowmobile clubs, state associations and dealers and distributors have actively worked to stimulate safe usage practices, and have taken steps to increase the user's perception of the sport's potentially adverse environmental impact.

The Vermont Association of Snow Travelers (VAST) has served as a model in this regard. They admit the need for certain regulations and, in addition to efforts such as those noted above, have worked closely with state officials to develop effective regulations. Furthermore, they have established a system of self-maintained trails for riding, coordinating the efforts of local groups and working with property owners to lessen unnecessary conflict.

Q. IS A LARGE SYSTEM OF TRAILS THE ANSWER?

For New England, trails could serve as an effective controlling factor. Many areas of snow vehicle use are on hilly, forested terrain, with deep snow accumulation in the more northern regions. These factors tend to encourage trail use by making "trail-blazing" individual efforts quite tedious.[37] Properly designed, and maintained, trails can also lessen encounters with competing recreational users--cross-country skiers, snowshoers, and other hikers. Trails can be selected to avoid critical natural areas, as well: winter deer yards, for example.

A trail-based pattern of snowmobile usage would also assist regulatory efforts and provide a safer form of the sport. The dangers of mechanical failure stranding a rider miles from help would be measurably diminished. Also, trails would allow a continuous monitoring of environmental effects, so that a re-routing is made when key indices signify

degradation of a pre-determined level of severity.

The reliance upon trails to regulate use is growing in popularity. Mr. Richard Gross, of the Department of Interior's Task Force on Off-Road Recreational Vehicles, stated that, "The motorized recreation vehicle in the future will, for the most part, depend upon established areas and trails specifically set aside and designated for this purpose."[38]

Q. WHAT ROLE WILL THE FEDERAL GOVERNMENT PLAY IN THIS FIELD WITHIN THE NEXT 10 YEARS?

Undoubtedly, the Federal agencies will increase their participation in the ORV issue. Included within the President's 1972 Environmental Message was the annoucement of Executive Order 11644, signed February 9, 1972. Designed to catalyze a uniform policy for off-road vehicle use on all public lands, this order required the Departments of Interior, Agriculture and Defense, and the Tennessee Valley Authority, to develop and to publish within one year a set of comprehensive regulations.

The Environmental Protection Agency, meanwhile, has received increased authority over environmental noise sources as a result of the Noise Control Act passed late in the 1972 session of Congress. It is reasonable to expect that the Agency will establish ceiling levels for engine noise shortly for both domestically-produced and imported snowmobiles.

The effect of such regulation, coupled with increasingly rigorous exhaust emissions standards, will almost certainly increase the cost and weight of these vehicles.

Additional regulations are likely to be promulgated by the National Highway Traffic Safety Administration to extend certain safety features to these vehicles. A special study by the National Transportation Safety Board, made public June 13, 1972, urged that this be done.

Appendix A shows a recent chronology of Federal activities connected with off-road vehicles.

Q. AS PART OF THE STATE REGULATORY SCHEME, REGISTRATION FEES ARE COLLECTED FROM SNOWMOBILE OWNERS. IS THIS A SIZABLE SUM, AND CAN IT IN ITSELF PROVIDE FOR THE ESTABLISHMENT AND MAINTENANCE OF TRAILS?

Some $1.1 million was collected in New England last year; a sizable figure, yet hardly enough to establish and maintain trails and provide for sufficient enforcement. However, less than 1/3 of these funds was utilized directly to support snowmobiling, with most of the monies returning to the cities and towns or becoming a portion of the General Funds of the New England states.

Q. HAVE THERE BEEN OTHER SUGGESTED SOURCES OF TRAIL FUNDS?

Yes, two particularly worthy of note. First, Malcolm Baldwin and Dan Stoddard, both of the Conservation Foundation,

TABLE B - CURRENT REGISTRATION RECEIPTS AND UTILIZATION BY STATE (Winter, 1971-72)

MAINE . . . . . 50,113 vehicles

Registration Fee - $ 10.00.	$501,130.00
Distribution	
$6.00 to towns.	300.678.00
$3.00 Fish & Game	150,339.00
$1.00 Parks & Recreation	50,113.00

MASSACHUSETTS . . . . . 35,300 vehicles

Registration Fee - $ 5.00.	$176.500.00
Distribution	
1/3 Motor Vehicle Dept.	58,833.00
2/3 Tax Bureau (Gen. Fund).	117,666.00

NEW HAMPSHIRE . . . . . 34,350 vehicles

Registration Fee - $ 9.00.	$309,150.00
Distribution	
$4.00 Fish & Game	137,400.00
$5.00 General Fund.	171,750.00

(All $9.00 from out-of-State registrations go to General Fund)

VERMONT . . . . . 24,000 vehicles

Registration Fee - $ 3.00.	$ 72,000.00
Distribution	
All to General Fund	72,000.00

CONNECTICUT . . . . . 7,260 vehicles

Registration Fee - $ 3.00.	$ 21,780.00
Distribution	
Highway Fund.	21,780.00

TOTAL REGISTRATION FEES COLLECTED . . . . . $ 1,080,560.00

DISTRIBUTION:

Returned to cities and towns. . . .	$300,678.00
Fish and Game Departments	287,739.00
Parks and Recreation	50,113.00
Motor Vehicle Departments	58,833.00
Highway Funds	21,780.00
General Fund	361,416.00

have suggested a significant increase in registration fees for vehicles intended for recreational usage, perhaps to $50 per vehicle per year.[39] Obviously, with some 200,000 vehicles expected within the region by 1973-74, this would yield $10 million annually.

A second proposal involves the application of state and Federal gasoline tax revenues collected on petroleum products intended for snowmobile use. Here, figures are less easily derived, however it is claimed that it would represent a sizable sum, which could be coupled with funds derived from registration fees at current levels.

IV SOCIAL IMPACT

The stratification of the American public by the snowmobile issue in areas of high usage has been mentioned briefly in earlier portions of this document. This particular segment is intended to display the intricacies of this phenomena and to attempt to acknowledge as many diverse perspectives on the issue as possible. The occurrence of incidents of violence--from shootings to purposeful erection of endangering obstacles--obviates the need to analyze the current emotionalism, and subsequently seek to modify it effectively. The immediacy of this problem is, indeed, so acute that it dwarfs by comparison considerations of secondary environmental impacts. Realistically, a comprehensive evaluation of the environmental consequences of snowmobile use is likely to follow the resolution of the difficulties this phenomena poses for the human cultural environment, rather than precede this.

Q. HAVE THERE ACTUALLY BEEN INCIDENTS IN WHICH BELEAGUERED LAND-OWNERS HAVE SHOT AT SNOWMOBILERS?

Yes, in fact several cases were recorded last year throughout various portions of the country. Within New England, at least one such incident occurred during the 1971-72 winter season, when a southern New Hampshire farmer

shot two riders. This individual's attempt to exert regulatory powers in his own particular brand was more than likely stimulated by both ineffective official enforcement efforts and a series of codes which were not responsive to the needs of this land-owner. Limitations on the posting of land to prevent snowmobile usage and intentional harassment aggravate such situations, and could easily precipitate more such incidents in the future.

Q. ISN'T THE RELATIONSHIP BETWEEN LAND OWNERSHIP AND LAND CONTROLS A KEY ISSUE HERE?

Most definitely. Until very recently, the burden for regulating land use fell upon the individual owning the land in each of the New England states. To prohibit the use of ORV's on his land, the owner was forced to post his land in accordance with state statutes. In certain states, limitations on the amount of one's land from which snowmobile use may be barred have been imposed. This presumption of free access has fomented encounters between land owners and snowmobile users, growing especially acute in cases of unauthorized removal of the signs. Here, even after the owner had displayed his desire to restrict use through an expenditure of his energies, he had no practical recourse against users who had removed the signs and entered his lands, professing a lack of knowledge of his wishes.

Q. HAVE ALTERNATIVE CONTROL MECHANISMS BEEN DEVELOPED IN THE FACE OF SUCH PROBLEMS?

Most of the New England states are currently contemplating, or have already, revised their posting statutes. The most radical departure from the current system is, of course, a complete reversal of the onus, to require the prospective user to obtain the express permission of the land owner prior to entering any property. Such a policy clearly gives the owner greater authority over use of his land, and additionally supplies enforcement officials an added criterion for control.

On the other hand, this policy is quite restrictive of the snowmobiler, especially discriminatory of users who are not in themselves large land-owners, and a perpetuation of the dangerous ethic which grants a land-owner virtually limitless control over natural resources not reflective of his mere passing presence in the world. Furthermore, it has been argued that such regulations are quite unnecessary in rural areas, where tracts of land are not intensively utilized by the owners, and border lines are both obscure and largely immaterial.

Perhaps the most serious implication, though, arises in states with large portions of their territory owned by out-of-state interests, for either investment or recreational purposes. Vermont, for example, faces this problem. The feelings of invasion and the dislike for these affluent,

infrequent neighbors by the established community has been manifested in such forms as bumper stickers proclaiming, "Don't shoot! - I'm a Vermonter!" Many long-time inhabitants, and especially those who own and operate snowmobiles, feel deeply offended by the efforts of these "outsiders," who frequently spend only a very few weeks per year in the area, to limit the use of the land. In the past, such owners have been a frequent target of harassment and de-posting. Opposition to legislation requiring the solicitation of prior permission from such land-owners, then is thus quite strong in Vermont and similarly affected states.

Past attempts to regulate land use by environmentally-concerned parties have sometimes met with opposition. For example, Dartmouth College attempted to exclude snowmobiles from a large tract of land it owns near Warren, New Hampshire, including the summit and south and east slopes of Mt. Moosilauke. Essentially, this decision was necessitated by on-going use of the area for several scientific experiments. The area has indeed been maintained as a natural area for many years; snowmobile use, in contrast, has been light until five years ago. Following the posting, an unidentified group of snowmobilers sent a threatening letter, the text of which follows:

Reproduced from best available copy.

Mr. President

We in the area understand you have contacted Charles Berry Conservation Officer of North Haverhill N.H. to prosecute any snowmobilers caught on the D. O. C. property on Moosilauke.

We have maps of your property and have found it impossible to use any alternate route to the summit without crossing your club's land as you own the summit. Because there is no alternative for us, we in turn are giving you no alternative. Either remove your posted signs and open Moosilauke to snowbilers or your facilities there will disappear from the face of the earth. You have until fall snow of 1972. We live here and you stop us from using it, you people don't and we will see to it that you don't either.

If you think I'm bluffing, try me, its your expense.

The "facilities" referred to in the letter can only be interpreted to mean the beautiful, rustic Moosilauke Ravine Lodge, built in 1937 and essentially irreplacable today. Perhaps this best displays the lack of understanding between the College, acting in a logical manner to insure a legitimate end, and the area residents. After consulting with the New Hampshire Fish and Game Department and ascertaining the complete inability of this enforcement branch to provide suitable protection, Dartmouth was forced to abandon its attempts to cordon off the area.

Q. WHY HASN'T THIS PROBLEM BEEN DEALT WITH AND SOLVED POLITICALLY, THROUGH COMPROMISE?

Any answer here must be largely speculative, but certainly some portions of the answer are readily apparent. This issue questions significant societal norms, such as ownership of land as discussed above. Further, it seems to strengthen already existing societal stratifications. Snowmobile owners tend to be middle-class, "blue-collar" workers.[40] Also, the nature of the sport itself, as well as the habits of the owners, have stimulated the growth of snowmobile clubs and associations, an aggregate effect lacking among many of its competing recreational forms. This factor lends an immediate advantage to the proponents of the sport, and also hinders compromise, which must be largely based upon opposing

values articulated by competing factions, not merely a handful of articulate advocates espousing a particular doctrine.

This distinction is quite apparent in a comparison of snowmobile organizations and associations of cross-country skiers. The latter are both numerically smaller and much less organized as an effective lobby group. Recently, however, this model has been somewhat altered, and competing lobbies have been developed. The potential for an anti-snowmobile backlash exists; further developments may magnify current problems.

Q. WHAT ABOUT ANY OTHER SOCIAL IMPACTS OF THE SPORT?

Snowmobiling has been hailed by many as a major positive cultural development. A lengthy article in the New York Times Magazine presented a well-summarized testimony for this contention.[41] In addition to the possible beneficial uses of these vehicles for rescue and relief missions, these craft have frequently catalyzed new family relationships. They allow individuals of all ages and sizes to participate as equals. Also, the snowmobile has been presented as the only viable alternative to endless hours before the television for many families in heavy snow regions.

Furthermore, many snowmobilers map out journeys designed to provide views of surroundings previously accessible only to the most dauntless observers. When used essentially as

a key to remote areas, and especially when coupled with ski or snowshoe expeditions, few can argue that the dominant purpose is anything but enjoyment of natural beauty. Without such vehicles, only a small portion of the users would be able to equal this exposure.

Clearly, then, the social impact of snowmobiling possesses both beneficial and detrimental components. However, these attributes are not amenable in themselves to balancing and resolution. Rather, the obstructive negative impact must be tempered first, and the societal benefits weighed against the total adverse environmental impact secondly.

V RECOMMENDATIONS

Upon reviewing the testimony presented at the Symposium and additional supplemental data, one quickly perceives the complexity of the snowmobile issue. Yet, this specific problem is merely symptomatic of the still more intricate phenomena of Off Road Recreational Vehicle (ORRV) usage throughout the United States. The lack of definitive data on environmental effects is matched by a parallel lack of information on the sociological and political implications of the sport. Synoptic decision-making is not currently practicable, and the present level of research seems hardly likely to develop an adequate data base within the near future. Strong indications of potential environmental damage seem to preclude a policy of delayed or continued minimal regulation, since such policies chance significant environmental degradation, perhaps observed only after irreparable harm has occurred.

For these reasons, the New England Youth Advisory Board advocates a coordinated policy of strict regulation and adequate enforcement. The remainder of this section will be devoted to an analysis of certain important components of such a policy. Significantly, these recommendations necessitate enforcement activities at each governmental layer; and close inter-governmental cooperation.

The core of the proposals is an ethic. While this ethic might be described simplistically as anti-technology, it is, in fact, certainly most this harsh. Rather, the Board recommends an energetic assessment of all technological developments in the CRRV field, encompassing an examination of both physical and social science implications. In essence, this involves an embodiment of the spirit of the title, but not the text, of an article in the January, 1971, edition of Snowmobiling Magazine: "Guilty Until Proven Innocent." Although such a presumption will undoubtedly attract vociferous criticism as overly restrictive, NE-YAB feels that such a perspective is an equitable compromise between essentially unregulated usage, marking a blatant failure to consider available evidence of environmental disruption, and an outright ban on these vehicles. Several European nations, including France, Switzerland and Norway, have already selected this latter route, irregardless of personal rights violations.

Although such a policy would act to retard or repress the dispersal of items which would, uncontrolled, meet with great receptivity in the marketplace, its compensatory asset would be an amelioration of the social problems currently manifested in the snowmobile problem. This would be accomplished by publicly weighing the costs and benefits of a technological development in a forum receptive to facts, not emotions. In this manner, the physical environmental factors initially

precipitating both the "Symposium on Snowmobiles and the Environment" and this report will be more amenable to investigation and solution.

To be effective, controls on snowmobile usage must be implemented in a complimentary fashion at all levels of government. The responsibilities pertinent to Federal, state and local bodies must be delineated and governmental interactions and joint needs must be identified. The principal burden for certain functions, particularly development of noise standards and funding of scientific research and monitoring, as well as direct controls over the vast body of public lands, must be vested within the Federal government for either statutory or pragmatic reasons. Still, the opportunity, indeed the necessity, for joint Federal-state action exists here; a workable scheme of enforcement must be developed, requiring both extensive inter-governmental cooperation and innovative techniques. NE-Y-B suggests that noise controls might serve as a highly suitable pilot program in this direction. The scarcity of state sound monitoring and testing equipment, and the unavailability of funds to acquire them, have been identified as chronic problems within the New England region, and may be presumed to be indicative of a more wide-spread problem. These handicaps currently inject a large measure of futility into the occasional efforts of states and municipalities to face the noise issue squarely.

The Noise Control Act of 1972 orders the Administrator of

EPA to determine allowable levels of noise emissions from a host of sources including ORRV's. NE-YAB endorses the establishment of the strictest possible standards achievable through existing technology, as well as periodic revisions, to incorporate newly developed techniques and devices. The Act further directs all Federal agencies to use "the full extent of their authority" to insure compliance with such standards once developed. Clearly, this necessitates the development, by EPA, of a workable enforcement scheme. NE-YAB concludes that one potentially effective action in this direction would be the development of a grant-in-aid program to the states for the purpose of procuring testing devices and training technicians. Furthermore, EPA should encourage the development of uniform state codes providing for comprehensive noise-standards enforcement. Components relevant to the noise field in this regard would be 1) annual inspection and testing programs, and 2) mobile monitoring programs. Agency actions in such directions would be in accordance with the broad mandate provided by the Act.

The advantages of Federally-conducted research are significant in two respects. First, such a centralization of data accumulation would aid both evaluation and dissemination of relevant information. Secondly, the Federal government offers greater financial resources for devotion to such research, optimized in impact because it may be directed so as to avoid repetitive efforts. EPA should commence research efforts on

ORRV effects in the following areas:

1) exhaust emissions
2) noise
3) compaction of snow
4) ultimate disposal.

Other Federal agencies, meanwhile, should investigate such factors as:

1) safety
2) impact on animal life
3) impact on vegetation.

NE-YAB endorses a policy of segregated and specialized land uses with respect to public lands. Snowmobiles should be prohibited from all but designated user areas, carefully selected and maintained to minimize adverse environmental effects, particularly upon fragile and wilderness areas. Areas selected for use would be developed expressly for ORRV usage of one or multiple varieties, and use should be based primarily upon a carefully designed and maintained trail system. Any area so selected should essentially be restricted to exclude use by competing recreational forms, in an attempt to lessen conflict between competing users. Usage of ORRV's would then be prohibited on all other public lands. An examina- of the feasibility of vehicle speed governors as enforcement tools should be conducted. Close coordination between responsible Federal and state agencies must arise to insure the interconnections of trail systems wherever possible.

Again, funding might well serve as the source of cooperation between Federal and state regulatory entities. Establishing and maintaining trail systems dictate large outlays of capital;

coupled with the costs of greatly augmented enforcement, it precludes conformance with a balanced-budget policy, if these expenditures are countered solely with the income generated by registration fees at current levels. Several parties, including the International Snowmobile Industry Association, have suggested one potential source of revenue to pay for these programs; a modification of the Highway Trust Fund. Specifically, they advocate the withdrawal of monies equivalent to the Federal gasoline taxes paid by snowmobile users on products used for these vehicles. Although no estimates of the amount of such revenues were presented, it was suggested that when coupled with current registration fees, a sizable pool would be created, to be directed at fostering trail systems, funding enforcement, and supporting scientific research and monitoring. YAB endorses in depth exploration of this concept.

NE-YAB supports the current pattern of state-level registration of snowmobiles, but finds that, in general, current statutes fail to include certain essential components. Frequently, criticism has been made of the registration number displayal methods. The largest practical size of decalcomania, preferably reflectorized, should be employed both on the front and on the rear of the vehicle. Strictly enforced statutes prohibiting the removal or obscuring of the registry numbers should be utilized.

Registration and licensing of vehicle operators are still more essential needs. The dangers inherent in the use of snowmobiles should preclude unregulated use by untrained individuals. A licensing program similar to those preparing power boat operators is recommended. Minimum age requirements should be established; perhaps 16, with provisional licenses granted to 15 year-olds following completion of a comprehensive safety and environmental awareness course.

As noted earlier in this report, snowmobile usage on and across highways is subject to stringent regulation throughout New England. This policy must be retained, and should be joined by additional restrictive measures designed to ensure safety precautions and to lessen land use conflicts. Land posting regulations should reflect this latter concept; thus, state codes should require snowmobilers to obtain expressed permission prior to entering any privately-owned lands or, either alternatively or in conjunction, to open lands to snowmobile use only if tracts are specifically posted as available for such usage. State-owned lands should be subjected to those criteria suggested previously for Federal lands: segregated uses, trail systems, and careful monitoring. States should also consider the establishment of certain additional safety codes. Mandatory use of helmets and earplugs might be considered.

State legislation should also be developed to assist and regulate the establishment of privately-owned and operated

snowmobile user areas. NE-YAB recommends that such areas be subjected to mandatory licensing and periodical inspection by the appropriate state agencies. In return for observing state-promulgated standards or safety and environmental controls and payment of a reasonable annual fee; the areas would be accorded recognition and publicity by the state through an official state publication. Additionally, such areas might well receive protective legislation limiting their liabilities for personal injuries incurred by users, providing the areas are adequately maintained in accordance with state guidelines.

Regulation of many additional types should not be preempted by the state legislatures. Local governmental bodies should be allowed discretion on such measures as curfews and buffer zones. In this way, particular geographic and societal characteristics can be recognized and incorporated into ordinances. Furthermore, a great deal of interaction is likely between local enforcement officials and snowmobile clubs, and increased flexibility of regulations might well function in a manner supportive of user group self-policing. Heightened safety and environmental considerations should be sought by municipalities through a variety of educational programs. NE-YAB firmly believes that the programs outlined in this section are both reasonable and realistic. Through such mechanisms, environmental protection can be afforded

without extensive infringements upon individual rights. Prompt implementation of these suggestions seem to this body to be the most likely means of alleviating the current trend toward a crisis situation.

Footnotes

1. From an article in Concord (N.H.) Monitor, March 5, 1971.

2. Conflicting figures and estimates abound. Among the most widely publicized are those found in:

   a) Proceedings of the 1971 Snowmobile and Off the Road Vehicle Research Symposium, Michigan State Univ., Technical Report 48, College of Agriculture and Natural Resources. June, 19

   b) Statistics available from International Snowmobile Industry Association, 5100 Edina Industrial Blvd., Minneapolis, Minn. 55435

   c) Hearings before Subcommittee on Parks and Recreation, U. S. Senate Committee on Interior and Insular Affairs, entitled Snowmobiles and Other Off-Road Vehicles, 92nd Congress, 1st Session, May, 1971.

   d) Baldwin, The Off-Road Vehicle and Environmental Quality, Conservation Foundation, Washington, D.C.

3. From the speech by Richard Gross, BOR, Dept. of Interior, in the unpublished transcript of "Symposium on Snowmobiles and the Environment," hereafter Symposium.

4. From the speech by Gregor McGregor, Assist. Atty. Gen., Massachusetts at Symposium.

5. From his Keynote address in Symposium.

6. Ibid.

7. Baldwin, p. 19.

8. Wanek, "A Study of the Impact of Snowmobiling on Northern Minnesota Ecology, Final Report on 1970-71 Research," Bemidji State College, Bemidji, Minn.

9. From a speech by Mr. Richard Griffith, New England Director of the Bureau of Sport Fisheries and Wildlife, published in Proceedings, 1970 International Snowmobile Congress, p. 80-81.

Footnotes (cont'd)

10. Internal memorandum on snowmobiling, Department of Environmental Protection, State of Connecticut.

11. From a speech by Dr. James Whittaker, School of Forestry Resources, Univ. of Maine, published in Proceedings of the 1971 Snowmobile and Off the Road Vehicle Research Symposium, p. 142-46.

12. Dr. William Schmid, University of Minnesota, and Julie Jarvinen, Research Fellow, in research reported in Proceedings of the 1971 Snowmobile and Off the Road Vehicle Research Symposium (p. 130-41) and also in Schmid's paper presented at "Snow and Ice Symposium," proceedings published by Iowa State University.

13. Ibid.

14. Wanck, op. cit., p. 118-27.

15. Schmid, op. cit.

16. Ibid.

17. Reported by Schmid in speech in Symposium.

18. Baldwin, op. cit., p. 35-42. Also, extensive newspaper and magazine clippings at Dartmouth College Environmen al Resource Library.

19. Statement by Mr. Paul Doherty in Symposium.

20. Statement by Mr. Norman Hayes in Symposium.

21. Statement by Mr. Richard Wettersten in Proceedings, 1970 International Snowmobile Congress, p. 42.

22. Statement by Mr. Paul Doherty in Proceedings, Third Annual International Snowmobile Congress, p. 39-41.

23. Berkeley Rice, "The Snowmobile Is an American Dream Machine," The New York Times Magazine, Feb. 13, 1972, p. 30.

24. Paper presented by Dr. Fred Bess at Symposium, also published in preliminary form in Proceedings of the 1971 Snowmobile and Off the Road Vehicle Research Symposium, p. 148.

25. Ibid.

26. Bess, op. cit., p. 148-55.

Footnotes (cont'd)

27. Bess, op. cit., p. 150-59.

28. From comments by Bess in Symposium, pp. 42-44 in unpublished transcript.

29. Rice, op. cit., p. 30.

30. Ibid.

31. Paul Prima in Snowmobile Accidents, winter, 1968-69, cited in Baldwin, op. cit., p. 71. Similar statistics available through the National Safety Council compilations.

32. Chism and Soule, "Snowmobile Injuries," Journal of the American Medical Association, v. 209, n. 11, Sept. 15, 1969; p. 1672.

33. Conrad Karleen and Harry Johnson. "Snowmobiling with Maxillo-facial Injuries," paper presented at the American Society of Maxillo-facial Surgeons, Boston, May 28, 1970.

34. Reinfeld. "Safety," speech published in Proceedings: Third Annual International Snowmobile Congress, p. 23.

35. Rice, op. cit., p. 26.

36. From comments by Mr. Jack Hoene in Symposium.

37. Most surveys reported to date indicate preference for trails: such evidence was reported by Mr. Richard Cross, in Symposium, also in a study by the Bureau of Planning, State of Minnesota (October, 1970). In this latter sampling, more than 75% of the users supported use on a system of trails.

38. Gross, op. cit.

39. From speech by Mr. Dan Stoddard in Symposium.

40. Several studies have been done on this topic. Rice, op. cit., reports this on p. 33. Also, surveys by the Conservation Foundation, reported by Stoddard in the unpublished transcript of the EPA-YAS Symposium, and a University of Connecticut student, reported in "A Survey on Popularity on Snowmobiling in Connecticut," Connecticut Woodlands, Fall, 1969, p. 14.

41. Rice, op. cit.

Symposium on Snowmobiles and the Environment

sponsored by the Youth Advisory Board of the Environmental Protection Agency

-44-

3 pm Workshops: Citizen comment and discussion of issues raised by the speakers

5:30 pm Cocktail Hour - Drake Room

6:30 pm Dinner - Drake Room

March 4

8:15 am Breakfast - Tavern Room

Program - Alumni Hall

9:30 am Effects of Snowmobile Noise on Operations
Dr. Fred H. Dee
Director of Audiology
Central Michigan University

10:15 am Physical and Ecological Effects of Snowmobile Use in Natural Areas
Dr. William Schmid
Department of Zoology
University of Minnesota

11:00 am The Impact of Snowmobile Noise
Elizabeth Cuadr
Deputy Director for Program Development
EPA Office of Noise Abatement & Control

11:45 am Land Use Policy and Controls
Richard Gross
U.S. Secretary of the Interior's Task Force on Off-Road Recreational Vehicles

1 pm Lunch - Tavern Room

2 pm Workshops

4 pm Panel Discussion - 28 Silsby Hall
Review of Conference Findings

5 pm Closing Remarks
Dennis Drapkin, Chairman
Youth Advisory Board

ENVIRONMENTAL PROTECTION AGENCY
2303 John F. Kennedy Federal Building
Boston, Massachusetts 02203

Official Business - Penalty for Private Use, $300

Postage and Fees Paid
Environmental Protection Agency

An Invitation...

The Youth Advisory Board to the Administrator of the U.S. Environmental Protection Agency will hold a regional conference on snowmobile use March 2-4 at Dartmouth College in Hanover, N.H.

As the number of snowmobiles in New England has mushroomed to more than 150,000, the effects of their use on people and the environment has become a matter of great controversy.

Should these vehicles, like motorboats, be left relatively free from government regulation? Or must they be strictly controlled to prevent damage to wildlife, vegetation, and our own peace and quiet?

By bringing together representatives of legislative bodies, snowmobile manufacturers, and the scientific community, the Environmental Protection Agency hopes to inform itself and to present you with hard data on the effects of snowmobile use. In addition, the Youth Advisory Board will hold afternoon workshops to solicit the views and comments of citizens, law enforcement officials, and other interested parties on an appropriate response to the issue.

We invite you to attend what we feel will be a timely and informative conference.

****

Schedule of Events

March 2

3 pm Registration at Hanover Inn, Hanover, N.H.

6:30 pm Buffet Dinner - Drake Room, Dartmouth College

8 pm Program - Alumni Hall

Welcoming Remarks
Dennis Lonpkin, Chairman
Youth Advisory Board

Keynote Address
John A.S. McGlennon
Regional Administrator
Environmental Protection Agency

Off-Road Vehicles: The Nature of the Problem
Bernard S. Martin, Staff
Committee on Interior and Insular Affairs United States Senate

March 3

8:15 am Breakfast - Tavern Room, Hanover Inn

Program - Alumni Hall

9:30 am Legislative Solutions: Regulation of Off-Road Vehicles
Dan Dreyfus
Conservation Foundation
Washington, D.C.
Co-Author with Malcolm Baldwin of "The Off-Road Vehicle and Environmental Quality"

10:15 am Enforcement Experience: Problems of Implementation
Gregor I. McGregor
Assistant Attorney General
Chief, Division of Environmental Protection, Commonwealth of Mass.

11:00 am The Industry Approach
Jack V. Hoose
Director of Public Relations
International Snowmobile Industry Association

11:45 am Off-Road Vehicles on Public Lands
Robert J. Smith, Chief
Division of Wildlife
Bureau of Land Management
U.S. Department of the Interior

1:00 pm Lunch - Tavern Room, Hanover Inn

2:30 pm Panel Discussion - 28 Silsby Hall
Existing and Proposed Legislation

RETURN RESERVATIONS BY FEB. 18, 1972

$_____ Total

Conference Registration Fee (Required): $2.00 per day of attendance

March 2 ☐ March 3 ☐ March 4 ☐

Meals (Optional): March 2 Dinner $6.00 ☐ Luncheon $3.00 ☐☐
March 3 Breakfast $1.50 ☐ Cocktails $2.00 ☐☐ Dinner $5.00 ☐☐
March 4 Breakfast $1.50 ☐☐ Luncheon $2.50 ☐☐

Lodging (Optional): At Hanover Inn: Single $13.75 ☐ Double $19.95 ☐
March 2 ☐ March 3 ☐

Lodging is also available in motels ($6-7 per night) and in private homes (approximately $3 per night). Contact Mr. Derrick Crandall at 603-646-2428 (day) and 603-643-9707 (eve) for information.

Send this form with check to Mr. Derrick Crandall, Dartmouth College, Hanover, N.H. 03755. Check or Money Order should be payable to: YAB SNOWMOBILE CONFERENCE